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Find distance from camera to object/marker using Python and OpenCV

by [Adrian Rosebrock](https://www.pyimagesearch.com/author/adrian/) (<https://www.pyimagesearch.com/author/adrian/>) on January 19, 2015

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It was an interesting project to work on, although the system was not as accurate as I wanted it to be — the “motion blur” of the ball moving so fast made it hard to obtain highly accurate estimates.

My project was definitely an “outlier” situation, but in general, determining the distance from a camera to a marker is actually a very well studied problem in the computer vision/image processing space. You can find techniques that are very straightforward and succinct like the triangle similarity. And you can find methods that are complex (albeit, more accurate) using the intrinsic parameters of the camera model.

In this blog post I'll show you how Cameron and I came up with a solution to compute the distance from our camera to a known object or marker.

Definitely give this post a read — you won't want to miss it!



Looking for the source code to this post?

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Triangle Similarity for Object/Marker to

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= 24 inches in front of my camera and take a photo. When I measure the width of the piece of paper in the image, I notice that the perceived width of the paper is $P = 248 \text{ pixels}$.

My focal length F is then:

$$F = (248 \text{ px} \times 24 \text{ in}) / 11 \text{ in} = 543.45$$

As I continue to move my camera both closer and farther away from the object/marker, I can apply the triangle similarity to determine the distance of the object to the camera:

$$D' = (W \times F) / P$$

Again, to make this more concrete, let's say I move my camera 3 ft (or 36 inches) away from my marker and take a photo of the same piece of paper. Through automatic image processing I am able to determine that the perceived width of the piece of paper is now 170 pixels. Plugging this into the equation we now get:

$$D' = (11 \text{ in} \times 543.45) / 170 = 35 \text{ in}$$

Or roughly 36 inches, which is 3 feet.

Note: When I captured the photos for this example my tape measure had a bit of slack in it and thus the results are off by roughly 1 inch. Furthermore, I also captured the photos hastily and not 100% on top of the feet markers on the tape measure, which added to the 1 inch error. That all said, the triangle similarity still holds and you can use this method to compute the distance from an object or marker to your camera quite easily.

Make sense now?

Awesome! Let's move into some code to see how finding the distance from your camera to an



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```

1.  " Import the necessary packages
2.  from imutils import paths
3.  import numpy as np
4.  import imutils
5.  import cv2
6.
7.  def find_marker(image):
8.      # convert the image to grayscale, blur it, and detect edges
9.      gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
10.     gray = cv2.GaussianBlur(gray, (5, 5), 0)
11.     edged = cv2.Canny(gray, 35, 125)
12.
13.     # find the contours in the edged image and keep the largest one;
14.     # we'll assume that this is our piece of paper in the image
15.     cnts = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
16.     cnts = imutils.grab_contours(cnts)
17.     c = max(cnts, key = cv2.contourArea)
18.
19.     # compute the bounding box of the of the paper region and return it
20.     return cv2.minAreaRect(c)

```

The first thing we'll do is import our necessary packages (**Lines 2-5**). We'll use `paths` from `imutils` to load the available images in a directory. We'll use NumPy for numerical processing and `cv2` for our OpenCV bindings.

From there we define our `find_marker` function. This function accepts a single argument, `image`, and is meant to be utilized to find the object we want to compute the distance to.

In this case we are using a standard piece of 8.5 x 11 inch piece of paper as our marker.

Our first task is to now find this piece of paper in the image.

To do this, we'll convert the image to grayscale, blur it slightly to remove high frequency noise, and apply edge detection on **Lines 9-11**.

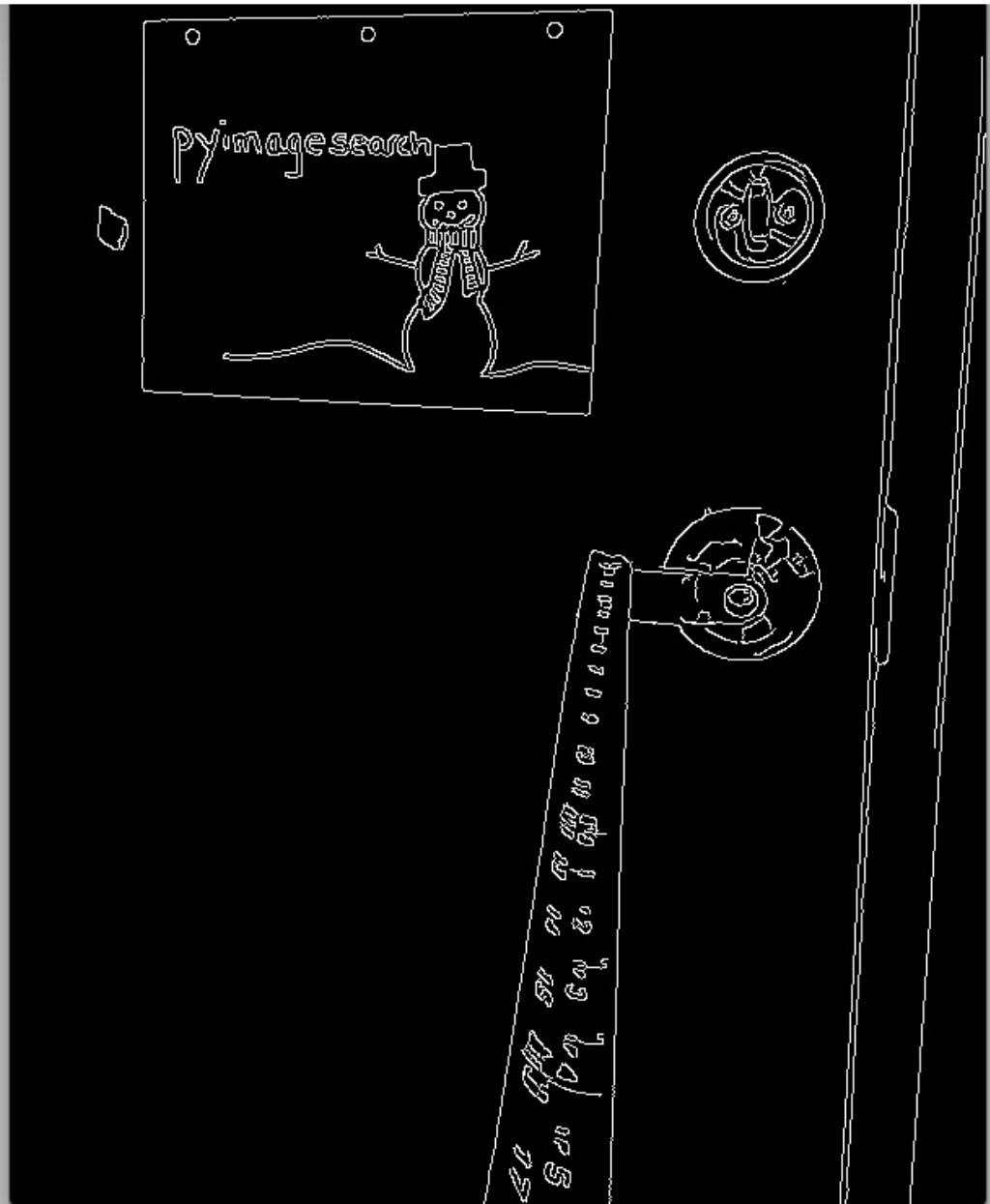
After applying these steps our image should look something like this:

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We are making the assumption that the contour with the largest area is our piece of paper. This assumption works for this particular example, but in reality *finding the marker in an image is highly application specific*.

In our example, simple edge detection and finding the largest contour works well. We could also make this example more robust by applying contour approximation, discarding any contours that do not have 4 points (since a piece of paper is a rectangle and thus has 4 points), and then finding the largest 4-point contour.

Note: More on this methodology can be found in [this post](#)

<https://pyimagesearch.com/2014/09/01/build-kick-ass-mobile-document-scanner-just-5-minutes/> on building a kick-ass mobile document scanner.

Other alternatives to finding markers in images is to utilize color, such that the color of the marker is substantially different from the rest of the scene in the image. You could also apply methods like keypoint detection, local invariant descriptors, and keypoint matching to find markers; however, these approaches are outside the scope of this article and are again, highly application specific.

Anyway, now that we have the contour that corresponds to our marker, we return the bounding box which contains the (x, y) -coordinates and width and height of the box (in pixels) to the calling function on **Line 20**.

Let's also quickly define a function that computes the distance to an object using the triangle similarity detailed above:

```
Find distance from camera to object using Python and OpenCV
22. | def distance_to_camera(knownWidth, focalLength, perWidth):
23. |     # compute and return the distance from the maker to the camera
24. |     return (knownWidth * focalLength) / perWidth
```

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```

34. # load the first image that contains an object that is KNOWN TO BE 2 feet
35. # from our camera, then find the paper marker in the image, and initialize
36. # the focal length
37. image = cv2.imread("images/2ft.png")
38. marker = find_marker(image)
39. focalLength = (marker[1][0] * KNOWN_DISTANCE) / KNOWN_WIDTH

```

The first step to finding the distance to an object or marker in an image is to *calibrate* and *compute the focal length*. To do this, we need to know:

- The distance of the camera from an object.
- The width (in units such as inches, meters, etc.) of this object. *Note:* The height could also be utilized, but this example simply uses the width.

Let's also take a second and mention that what we are doing *is not true camera calibration*. True camera calibration involves the intrinsic parameters of the camera, which you can read more on [here](http://www.vision.caltech.edu/bouguetj/calib_doc/htmls/parameters.html) (http://www.vision.caltech.edu/bouguetj/calib_doc/htmls/parameters.html).

On **Line 28** we initialize our known `KNOWN_DISTANCE` from the camera to our object to be 24 inches. And on **Line 32** we initialize the `KNOWN_WIDTH` of the object to be 11 inches (i.e. a standard 8.5 x 11 inch piece of paper laid out horizontally).

The next step is important: ***it's our simple calibration step.***

We load the first image off disk on **Line 37** — we'll be using this image as our calibration image.

Once the image is loaded, we find the piece of paper in the image on **Line 38**, and then compute our `focalLength` on **Line 39** using the triangle similarity.

Now that we have “calibrated” our system and have the `focalLength`, we can compute the

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```
54. |         (image.shape[1] - 200, image.shape[0] - 20), cv2.FONT_HERSHEY_SIMPLEX,  
55. |         2.0, (0, 255, 0), 3)  
56. |     cv2.imshow("image", image)  
57. |     cv2.waitKey(0)
```

We start looping over our image paths on **Line 42**.

Then, for each image in the list, we load the image off disk on **Line 45**, find the marker in the image on **Line 46**, and then compute the distance of the object to the camera on **Line 47**.

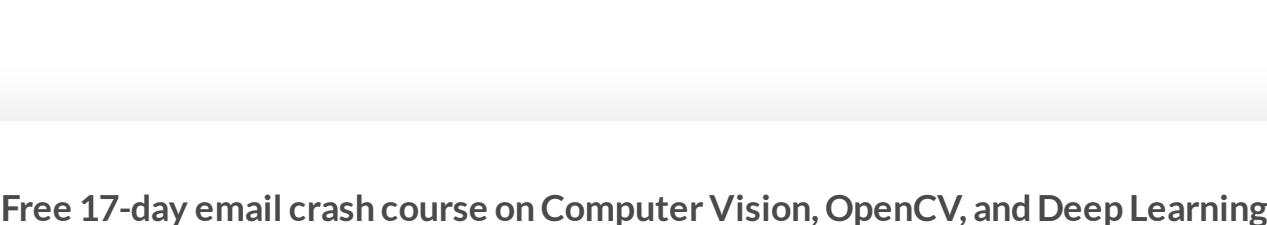
From there, we simply draw the bounding box around our marker and display the distance on **Lines 50-57** (the `boxPoints` are calculated on **Line 50** taking care to handle different OpenCV versions).

Results

To see our script in action, open up a terminal, navigate to your code directory, and execute the following command:

```
Find distance from camera to object using Python and OpenCV  
1. | $ python distance_to_camera.py
```

If all goes well you should first see the results of `2ft.png`, which is the image we use to “calibrate” our system and compute our initial `focalLength`:



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Now that we have our focal length, we can compute the distance to our marker in subsequent images:



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In above example our camera is now approximate 3 feet from the marker.

Let's try moving back another foot:



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That all said, the triangle similarity approach detailed in this article will still work and allow you to find the distance from an object or marker in an image to your camera.

Summary

In this blog post we learned how to determine the distance from a *known object* in an image to our camera.

To accomplish this task we utilized the *triangle similarity*, which requires us to know two important parameters prior to applying our algorithm:

- 1 The *width (or height)* in some distance measure, such as inches or meters, of the object we are using as a marker.
- 2 The *distance* (in inches or meters) of the camera to the marker in step 1.

Computer vision and image processing algorithms can then be used to automatically determine the perceived width/height of the object in pixels and complete the triangle similarity and give us our focal length.

Then, in subsequent images we simply need to find our marker/object and utilize the computed focal length to determine the distance to the object from the camera.

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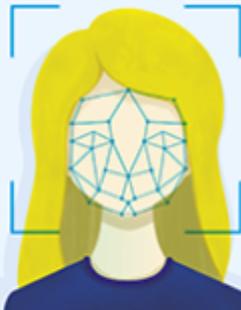
```

1 # construct the new head model that will be
2 # placed on top of the
3 # the base model
4 headModel = baseModel.output
5 headModel = cv2.dnn.blobFromImage(baseModel,
6 headModel = cv2.dnn.blobFromImage(baseModel,
7 activationLayer=baseModel.getLayerNames()[-2])
8 headModel = cv2.dnn.blobFromImage(baseModel,
9 headModel = cv2.dnn.blobFromImage(baseModel,
10 activationLayer=baseModel.getLayerNames()[-2])
11 # place the head model on top of the
12 # model (the output blob)
13 model.setInput(headModel)
14 # the activation layer
15 model = cv2.dnn.readNet("head_detector.onnx")
16 outputs=model.forward()
17
18 # loop over the outputs
19 them so that we can

```

COMPUTER VISION AND DEEP LEARNING

Resource Guide



Dr. Adrian Rosebrock

pyimagesearch

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About the Author

Hi there, I'm Adrian Rosebrock, PhD. All too often I see developers, students, and researchers wasting their time, studying the wrong things, and generally struggling to get started with Computer Vision, Deep Learning, and OpenCV. I created this website to show you what I believe is the best possible way to get your start.

Previous Article:

25 minutes later...PyimageSearch Gurus is FULLY FUNDED!

(<https://www.pyimagesearch.com/2015/01/14/25-minutes-later-pyimagesearch-gurus-fully-funded/>)

Next Article:

Multi-scale Template Matching using Python and OpenCV

(<https://www.pyimagesearch.com/2015/01/26/multi-scale-template-matching-using-python-opencv/>)

289 responses to: Find distance from camera to

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distance-of-an-object-in-a-photo)**joe**

January 22, 2015 at 12:11 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-270583>)

How could you apply these techniques to sports events photos taken with a telephoto lens?

**Adrian Rosebrock**

January 22, 2015 at 12:43 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-270606>)

You would have to estimate the intrinsic parameters of the camera which requires calibration with a “chessboard”.

**ASAD**

March 5, 2019 at 11:04 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505046>)

Hello Adrian I want one help . Actually I want to make a project in which I want take an image from any distance and want to know the center and dimensions of that circle

**sc**

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Hi Adrian,

Nice post, I will try to implement the idea to determine the size of an object after the calibration.



Hajar

February 6, 2015 at 11:38 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-276987>)

Great article Adrian, it was really helpful! Thank you so much!



Adrian Rosebrock

February 6, 2015 at 1:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-277035>)

I'm glad you enjoyed it Hajar! 😊



JD

April 11, 2015 at 2:01 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-303972>)

hev. Adrian

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contours from the `cv2.findContours` function. In this example, I'm simply taking the largest one, but in your case, you should loop over each of the contours individually and process them and see if they correspond to your marker.

**Aminah**

September 9, 2017 at 2:17 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-434457>)

I want to use this technique with android device too. 😊

**Sidharth**

April 11, 2019 at 1:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-512243>)

hey,could you help me, I'm working on this and trying to implement it in my android device too

**Anton (<http://jasaplus.com>)**

April 12, 2015 at 6:05 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-304164>)

on above example, we know the width of an object. What if we don't know the width of the object ? for example in real life situation where a robot need to navigate the it meets each unknown object and need to find the distance even tough it has now knowledge about each objects actual width. Any other examples ?



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**Sowjanya Chunduri**November 20, 2018 at 11:29 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-488174>)

Can we use a web-camera in an unconstrained environment for measuring the depth of an image?

**Pradeesh (<http://pradeeshxdmaniyeri@gmail.com>)**January 26, 2019 at 8:36 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-498018>)

How an stereo camera can be used to find the distance of unknown obstacles?

**Karen**January 29, 2020 at 10:22 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-688273>)

For those who may still be looking for this information, once you have distances, it's not hard to calculate widths (or heights). Just solve the original formula

$$D = (W * F) / P$$

for W, algebraically, which is

$$W = (D * P) / F$$



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**Adrian Rosebrock**

May 1, 2015 at 7:08 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-311408>)

Take a look at **this post on HOG + Linear SVM, I think it will really help you get started.** (<https://www.pyimagesearch.com/2014/11/10/histogram-oriented-gradients-object-detection/>)

**Dries**

May 2, 2015 at 6:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-311524>)

Hi there Andrian!

First of all i'm very thankful for this and other tutorials out there! this is by far the best series of tutorials online! Perfectly described step by step and explained why to preform every step 😊 I can't thank you enough!

I'm trying to do the same thing as described in the above tutorial (finding an object and determine the distance between obj and camera) but i wonder how i should do it when using constant streaming video instead of loading images?

thanks!



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**lady kenna**

June 7, 2015 at 2:11 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-323798>)

what if i wanted to display cm instead of ft?

**Adrian Rosebrock**

June 7, 2015 at 6:44 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-323857>)

Your final metric is completely arbitrary — you can use feet, meters, centimeters, whatever you want. Take a look at **Lines 25 and 29** and redefine them using the metric you want. And then you'll need to modify **Line 52** to output your metric instead of feet.

**raj**

August 18, 2015 at 11:41 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-347370>)

Hi there,

when i try the same code using 2 feet and an image of 1 inch ,the focal length is around 1260 . Is this ok ? coz im getting unacceptable distances of around 3.4 feet for 6 feet... Are there any limits for this method . I find this method really interesting . i am thinking forward to do this in

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`cv2.VideoCapture` function. See [this post](#)

(<https://www.pyimagesearch.com/2015/05/25/basic-motion-detection-and-tracking-with-python-and-opencv/>) for an example of grabbing frames from the webcam stream.



David

September 4, 2015 at 2:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-353929>)

Hi Adrian, Excelent tutorial i have a question for you, i hope you can help me.

i need the position (X,Y,Z) in mm, with your tutorial i could get the point z, my problem is when i calibrate the camera to get the points X,Y my Z is wrong.

do you know what happens?

Thanks.



Adrian Rosebrock

September 5, 2015 at 5:28 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-354205>)

Are you doing work in 3D? If so, this method is not suited for 3D and you'll need to use a different calibration method to examine the [intrinsic parameters](#) (https://en.wikipedia.org/wiki/Camera_resectioning#Intrinsic_parameters).



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I am ready the detection and tracking. but I'm having trouble getting the positions X , Y, Z . I research the transformation from 3D to 2D but there are certain points that do not understand.

do you can help me?

Thanks a lot



Matt

April 20, 2016 at 8:39 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-395333>)

Hi David !

Currently, I'm working on a similar project, and I have a problem to do the relationship between coordinates in the 3D and servos. First, I would like to compute and track my 3D-coordinates object but it does not work.

Did you find an idea ?

Thanks



murugan

October 16, 2015 at 10:35 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-374700>)



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**murugan**

October 20, 2015 at 1:17 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-373290>)

hi sir

i tried cv2.videocapture but ended with errors so i request you to modify the program

**Adrian Rosebrock**

October 20, 2015 at 6:11 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-373349>)

If you are getting errors related to `cv2.VideoCapture` you should ensure that your installation of OpenCV has been compiled with video support.

**hyshan**

October 21, 2015 at 9:43 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-373965>)

Hi Adrian, how do you define the marker?



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[October 20, 2015 at 11:20 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-375196>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-375196)

excuse me, I want to know how to realise it in real-time camera?



Adrian Rosebrock

[October 27, 2015 at 4:55 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-375426>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-375426)

In order to perform real-time distance detection, you'll need to leverage the `cv2.VideoCapture` function to access the video stream of your camera. I have an example of accessing the video stream in [this post](#) (<https://www.pyimagesearch.com/2014/12/15/real-time-barcode-detection-video-python-opencv/>). I also cover accessing the video stream more thoroughly inside [Practical Python and OpenCV](#) (<https://www.pyimagesearch.com/practical-python-opencv/>).



Shatha Omar

[November 1, 2015 at 11:07 pm \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-377017>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-377017)

Hi , this is a great helpful job
please i'm working on application that take an image then find the object to calculate its dimensins , so i need to know the distance or if there is another blog/ article/ refferance you can help me with

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**khalil**

November 19, 2015 at 1:29 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-379753>)

Thanks for your nice post.. it is really a good job.. dear, is there any additional procedure for which i can use this procedure for the unknown object distance measurement from camera....

**Adrian Rosebrock**

November 20, 2015 at 6:30 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-379913>)

You'll need to know the size of some object in the image to perform camera calibration. In this example, we have a piece of paper. But you could have used a coin. A coffee cup. A book. But the point is that you *need* to know the size of object(s) you'll be using to perform the camera calibration using triangle similarity.

**Minjae**

November 24, 2015 at 2:39 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-380529>)

Hi, Thank you for this post.

I'm looking for like Johnny Chung Lee's Wii headtracking in VR Juggler through VRPN projects.



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```
File "distance_to_camera.py", line 16, in tina_marker
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
ValueError: too many values to unpack (expected 2)
```

3. console

(image:867): Gtk-WARNING **: cannot open display:

4. cv virtualenv

same with 2.

Please let me know the reason...



Adrian Rosebrock

November 24, 2015 at 6:35 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-380552>)

Hey Minjae:

1. I'm not a Windows user, so I'm not sure about this particular problem. Perhaps another PyImageSearcher reader can help you out here.

2. The code associated with this post was built for OpenCV 2.4. You are using OpenCV 3. You need to update the `cv2.findContours` function call, [here](#) (<https://www.pyimagesearch.com/2015/08/10/checking-your-opencv-version-using-python/>) to work with OpenCV 3..

3. Are you SSH'ing into your Pi? If so, make sure you pass in the `-X` flag for X11 forwarding.

X

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**Adrian Rosebrock**

November 25, 2015 at 1:54 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-380771>)

Hey Nami, you might want to look into [camera calibration \(https://opencv-python-tutorial.readthedocs.org/en/latest/py_tutorials/py_calib3d/py_calibration/py_calibration.html#calibration\)](https://opencv-python-tutorial.readthedocs.org/en/latest/py_tutorials/py_calib3d/py_calibration/py_calibration.html#calibration) and the intrinsic camera parameters.

**nami**

November 26, 2015 at 12:11 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-380851>)

Hi adrian,

So after we do camera calibration and get focal length (fx, fy), principal point, etc. How can i measure the object distance? with object size in real world undefine..

Thanks..

**Adrian Rosebrock**

November 26, 2015 at 6:52 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-380892>)

You basically need to convert the “pixel points” to “real world” points, from there the distance between objects can be measured. This is something I’ll try to cover on



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[December 26, 2019 at 10:00 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-617905>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-617905)

Sorry, I haven't had a chance to publish a tutorial on that topic yet.



mert

[January 7, 2016 at 7:54 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-385877>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-385877)

Hello Adrian. First of all , This is a great website. I have a question : Is this distance estimation can be done in real time processing applications. I mean I want to measure distance from an object(circular and coorful) to my robot while the robot moving on a straight line. I use a moderate camera with low resolution(usb cam).How should I do that



Adrian Rosebrock

[January 7, 2016 at 12:36 pm \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-385912>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-385912)

Yes, this can absolutely be done in real-time processing, that's not an issue. As long as you perform the calibration ahead of time, you can certainly perform the distance computation in your video pipeline.



mert



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Camera calibration (at least the calibration discussed in this post) is actually pretty straightforward. This post assumes you have a 90-degree straight-on view of the object. For angled positioning this approach won't work well unless you can apply a perspective transform. You should look into [more advanced camera calibration \(\[https://opencv-python-tutroals.readthedocs.org/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib\]\(https://opencv-python-tutroals.readthedocs.org/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib\)\)](https://opencv-python-tutroals.readthedocs.org/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib) methods.



mert

[January 8, 2016 at 1:52 pm \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-386042>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-386042)

Got it. I'll get right on it. Hope to meet you



JolyDroneSP

[January 18, 2016 at 9:17 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-387204>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-387204)

Hi Adrian. Thanks for the good work, it's the most concise guide to this topic that I have found!

By the way, what camera did you use for this project?

I am trying to implement it through raspberry pi board camera and it doesn't seem to work...



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**Tejas**

January 22, 2016 at 1:40 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-387666>)

Hello Adrian!

First of all, thank you for a wonderful tutorial as always. I am working on a similar project and need some help.

1. Is there a literature review available regarding all methods of depth estimation `without` using a stereo camera i.e. using only a normal single lens camera? If not, can you point me to resources – papers and hopefully implementations – about the state-of-the-art on this problem? I should mention that I am mainly interested in understanding the physics of the scene and not reconstructing per se. I haven't been able to find any decent open implementations of these and that's kind of sad.
2. I am investigating the importance of head movements in animals(humans included) for depth perception and came across few decade old papers on the topic. Can you provide me references on how motion of camera affects detection of edges, depth estimation etc from a computer vision perspective? Aligning with point 1, I am looking for something on the lines of how one can estimate depth accurately by moving the single lens camera and detect edges and/or object boundaries by virtue of this movement. Methods like triangle similarity aren't really helpful since they need an estimate of the original size of object/marker in question.

Please help me out with this and keep up the good work! 😊



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[February 5, 2016 at 2:43 pm \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-389169>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-389169)

I may be coming in a little for this post but Im having trouble with the code.
When I run it I get the following error. Can you please assist me with this.
By the way I think you are doing an awesome job.

```
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
ValueError: too many values to unpack
```



Adrian Rosebrock

[February 6, 2016 at 9:56 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-389245>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-389245)

Please see my reply to Minjae above and read [this post](#) (<https://www.pyimagesearch.com/2015/08/10/checking-your-opencv-version-using-python/>) for more information.



Swan

[August 22, 2016 at 7:52 pm \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-404787>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-404787)

Thanks for that clarification!



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I honestly don't do much work in stereo vision, although that's something I would like to cover in 2016. Once I get a tutorial going for stereo version, I'll be sure to let you know!

**azizul**

February 18, 2016 at 12:26 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-390414>)

i will be really please to hear the news from u...thnk u very much 😊

**Jon**

February 21, 2016 at 5:52 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-390616>)

Hi Adrian!

First off, kudos on making such a complex system seem so intuitive! It makes the process look so much less intimidating to us newbies (whether I'm able to follow along once my picam gets here is another story!)

My question for ya is this: assuming I can manage to follow along and get distance readings for my marker, how difficult would it be to add the code required to trigger an event on a device that the marker is mounted to? In my case, I am looking to vibrate a small motor when the tracked object is more than 10 feet away. Ideally, it would increase in intensity based on how much further the object gets from the camera. I know this would require some investment in

X

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make a check if the object is > 10 feet away. If it is, then you call your buzzer code.

**Randy**

April 7, 2016 at 6:38 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-394243>)

In OpenCV 3, we must use cv2.boxPoints(marker) instead of cv2.cv.BoxPoints(marker).

**Adrian Rosebrock**

April 7, 2016 at 12:33 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-394267>)

You're absolutely right Randy!

**Kenton**

May 26, 2017 at 1:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-426075>)

Hey,

I'm messing with this stuff now and it's not working out too well for this part.

My error is cv2 has no attribute boxPoints.

Is there a way around this you can think of?



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**Kevin**

April 13, 2016 at 7:50 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-394864>)

Hey Adrian, great work! This was very informative and well done. I have a quick question regarding the limitations of such an approach when using larger distances. For example, 30 feet. At this distance, a relatively small object may be represented by very few pixels right? I'm assuming the better the camera (with better resolution) the farther the range in which this approach can still be accurate. My question is whether my assumption is indeed correct?

Furthermore, I find that when I utilize this approach, the distance calculation sometimes fluctuates as the perceived width in pixels fluctuates. Could this be due to noise? And if so, what are some good techniques to reduce said noise? I've looked into the blur function in OpenCV, but I haven't had much luck with that.

Thanks again for the website, it's super helpful. Look forward to hearing from you. Thank you!

**Adrian Rosebrock**

April 14, 2016 at 4:51 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-394945>)

Indeed, that is correct. The farther away the object is and the smaller the resolution of the camera is, the less accurate the approximation will be. As for reducing noise, that is entirely dependent on the image data you are working with. Blurring is one way to reduce noise. You might also want to look into the segmentation process and ensure you are obtaining an accurate segmentation of the background from the foreground. This can be done via



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April 17, 2016 at 3:31 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-395127>)

Please see my response to “Tyrone” above — the only change needed for this code to run with OpenCV 3 is to modify the `cv2.findContours`.



Abdul Javed

May 8, 2016 at 2:59 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397054>)

Hello Adrian... i just wanted to know that how can i use this distance recognition technique to make a 2D map of a vertical wall(whose photo can be taken easily) to precisely know the position of doors windows and other stuffs on the wall and the distances between each other and their dimensions with certain accuracy.....???



Adrian Rosebrock

May 9, 2016 at 6:54 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397171>)

Hi Adbul — I’m not sure quite sure what you mean by a 2D map of a vertical wall, but if you want *super precise* measurements between doors, windows, etc., then I would suggest using a 3D/stereo camera instead of a 2D camera. This will give you *much* better results.



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**Adrian Rosebrock**

May 10, 2016 at 8:12 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397256>)

Yes, even with the paper titled, this algorithm will still find the paper, *provided that* the paper is the largest contour area in the image. For a more robust algorithm for finding rectangular regions (and verifying that they indeed have 4 vertices), [please see this post](#) (<https://www.pyimagesearch.com/2014/09/01/build-kick-ass-mobile-document-scanner-just-5-minutes/>).

**Matt**

May 10, 2016 at 9:31 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397266>)

Ok, but for example, if you tilted your paper with an angle of 90 degrees, you do not detect a rectangle, so you do not know the distance between the object and the camera no?

**Adrian Rosebrock**

May 10, 2016 at 6:24 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397296>)

Hey Matt, I'm not sure I understand your question — a rectangle has 4 vertices, no matter how you rotate it. An easy way to detect rectangles in an image is to simply use contour approximation, which I mentioned in my previous comment.



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I thanks.

**Adrian Rosebrock**

May 12, 2016 at 3:33 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-397494>)

Oh, you were referring to the z-axis, that was my mistake. In that case, you would need utilize a more advanced algorithm to detect your object. This blog post is primarily geared towards easily detectable objects and computing the distance.

**Frane**

May 30, 2016 at 4:49 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-399153>)

Hi Adrian, i need to find the distance and cordinates of the red marker. I made the filter to see red color only but i have problem considering distance. I lose the “seeing” the red color after 10cm (the markers are 3 red circle diameter 10cm each in triangle formation). Im using raspberry pi 2 b+ and pi camera

**Adrian Rosebrock**

May 31, 2016 at 3:47 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-399264>)

How are you looking for the red color? Via color thresholding? If so, investigate the mask that



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Adrian Rosebrock

June 5, 2016 at 11:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-399654>)

You normally would use a single reference object to calibrate your camera. Once you have the camera calibrated, you can detect the distances/object sizes of varying sizes. [See this blog post for more information \(https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/\)](https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/).



Farzaneh Golkhoo

June 5, 2016 at 2:25 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-399662>)

Hi Adrian

Thanks for your great information, just I have a question.

if you take a picture of a special object for example in the ceiling and you are required to know the distance of that object from the camera but not the perpendicular distance, what should we do?

In fact I know the exact location of the camera (x,y,z) and also the location of the object in the ceiling in terms of (x,y) but I do not know the z of the object. I want to measure z.

As you said I can measure the perpendicular distance between the camera and the object by taking a picture of the object, but I have to know the direct distance (not perpendicular) between the camera and the object.



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what i calculate (F) is about $3600 \cdot 3/00$. and so it's give me wrong answer .



Adrian Rosebrock

June 9, 2016 at 5:27 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-399981>)

There is a difference between the focal length of the physical lens and the perceived focal length from the image. You'll need to calibrate your DSLR camera in the same way that you performed the calibrations on the Pi and mobile phone.



Chandrama

June 13, 2016 at 4:28 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-400154>)

Hello i am trying to use your code but not able to get output ,

getting error like..

```
Traceback (most recent call last):
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
ValueError: too many values to unpack
```

Please help to resolve



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OpenCV 3 [in this blog post](#) (<https://www.pyimagesearch.com/2015/08/10/checking-your-opencv-version-using-python/>).



Talgat (<http://none>)

[July 12, 2016 at 4:34 am](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-401972>)

Thank you!

Excellent article! But one little mistake that can confuse beginners, you wrote “perceived width of the paper is $P = 249$ pixels” but in calculations you used 248. Hope to see the tutorial on finding the distance to an randomly chosen object by using stereo-pair of cameras.



Adrian Rosebrock

[July 12, 2016 at 4:32 pm](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-402005>)

Thanks for pointing out the typo! I have corrected it now.



Amigo

[July 24, 2016 at 8:11 am](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-402801>)



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(<https://www.pyimagesearch.com/2016/04/04/measuring-distance-between-objects-in-an-image-with-opencv/>).

**Shiva**

September 6, 2016 at 2:19 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-405644>)

Hello Adrain,

Great Article to start with the distance estimation.

I have downloaded your code and trying to validate with images, but i am not getting the distance as expected. Could you please send me some reference images.

**Adrian Rosebrock**

September 6, 2016 at 3:38 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-405686>)

Hey Shiva — the downloads to this blog post also include the example images I included in this post. You can use these images to validate your distances.

**Thommy (<http://thomaspmujias.blogspot.com>)**

September 8, 2016 at 2:36 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-405781>)



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The code for this blog post was intended for OpenCV 2.4; however, you are using OpenCV 3. You can resolve the issue by changing the code to:

```
box = cv2.boxPoints(marker)
```

**Su**

November 1, 2017 at 2:09 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-439354>)

Hi Adrian,
Can you please help me here?

Traceback (most recent call last):
File "distance_to_camera.py", line 53, in
box = np.int0(cv2.BoxPoints(marker))
AttributeError: 'module' object has no attribute 'BoxPoints'

```
>>> cv2.__version__
'3.3.0'
```

**Adrian Rosebrock**

November 2, 2017 at 2:31 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-439484>)

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an object is true only if the object is placed at the focal length. If I place an object of unknown dimensions at an unknown distance from the camera lens, then there is no way to estimate the distance between them. Am I thinking right or is something missing? Can you please help.

Thanks

**Ondrej**

September 17, 2016 at 4:48 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-406297>)

Hi. I was thinking about make mobile app which will measure width and height some objects by using dual cameras like this: www.theverge.com/2016/4/6/11377202/huawei-p9-dual-camera-system-how-it-works. Do you think that it will be working? Thank you for your answer.

**Adrian Rosebrock**

September 19, 2016 at 1:10 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-406386>)

Using two cameras you can measure the “depth” of an image. I don’t cover this on the PyImageSearch blog, but it is absolutely possible.



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Absolutely, but you need to calibrate your system first as I did in [this blog post](#) (<https://www.pyimagesearch.com/2016/04/04/measuring-distance-between-objects-in-an-image-with-opencv/>) only this time using the green ball. From there you will be able to estimate distance.

**Erwin**

[October 7, 2016 at 1:26 am](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407681>)

Sorry, it seems to have phrased my question wrongly. What I meant was is it possible to find the distance from the camera to the green ball in real time? So instead of making it detect edges, i modified it to detect green?

**Adrian Rosebrock**

[October 7, 2016 at 7:21 am](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407692>)

Yes, it's absolutely possible. As long as you perform the calibration step *before* you try to find the distances you can use the same technique to determine the distance to the ball in real-time.

**Erwin**

[October 10, 2016 at 3:53 am](#) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407705>)



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Just a simple question. How you determine the “focalLength”?

**Adrian Rosebrock**

October 11, 2016 at 1:09 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407998>)

Take a look at the example in the “Triangle Similarity for Object/Marker to Camera Distance” section to see how focal length is computed. Otherwise, Lines 38 and 39 compute the `focalLength` variable.

**John**

October 9, 2016 at 6:09 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407813>)

Hello . I want to use this code to detect images real time using the PiCamera. I read your replies and honestly have no idea how to ” Use the `cv2.VideoCapture` function to access the stream of your camera ” . Playing with the code results in all sorts of errors. Could you help me by giving a detailed explanation ? Thanks

**Adrian Rosebrock**

October 11, 2016 at 1:05 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-407995>)



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Hi Adrain,

I am a big fan of your posts, I was impressed with all of what I have seen. I have a problem in my thesis that I guess you might help me in related to localization. My thesis project is automating the process of lawn mower. The mower will be given the size of a rectangle to cover then it will move back and forth starting from one of the corners. It will track its distance using wheel encoders, however, due to error due slippage and drifting. Therefore, we need a reliable method through which we can know the absolute location to correct for the relative localization error of wheel encoders. We have tried several methods and all had some problems:

- 1- Tracking successive features in frames to estimate the rotational and transnational matrices however for sharp turns it loses track of everything.
- 2- Triangulation by placing three balls of different colors and identifying the angle of each through a camera on a motor however using colors outdoor is so unreliable due different lightening at different day times. When you decrease the HSV scale becomes more accurate but increases the probability of loses balls and increasing range catches noise from the environment.
- 3- Using homography instead of color balls for triangulation but it is computationally slow.
- 4- Using April Tags or Aruco tags but as mechanical engineers, were are finding it hard to develop our algorithm and still we didn't find a starting point to continue on by finding a code and understanding it.

Hope U can help us and sorry for the long post



Adrian Rosebrock

October 17, 2016 at 3:54 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-408375>)

To start, it's always helpful to have actual real-world images of what you're working with. This



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[November 30, 2016 at 6:35 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412273\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412273)

hi Adrian. Firstly, thank you for sharing. nowadays I am working similar projects. so I have a question. there is an object with a known width w and I don't know distance D from my camera. in fact I will do that I will put a rectangular object (a box) with a known size under camera I will measure distance from object but I know only distance between camera and ground. how to do?



Adrian Rosebrock

[December 1, 2016 at 7:34 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412372\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412372)

If you know the distance from the ground to the camera and know the size of the object in both units (inches, millimeters, etc.) then you should be able to apply some trigonometry to workout the triangle property. I haven't actually tried this, so I'm just thinking off the top of my head. It might not work, but it's worth a shot.



Alex

[December 6, 2016 at 10:06 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412793\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-412793)

Hi Adrian, first of all, excellent article!

I have a question, regarding this code. I'm currently carrying out research for my dissertation which requires using stereo vision to calculate distance from the camera to a chosen

X

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should help you out.



Alpha

[January 5, 2017 at 11:10 am](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415201) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415201>)

i am doing a project in which i need to get the exact location of a human at a distance. Exact location refers to the EXACT location as used by a gun to aim at an enemy. Here, i dont have any marker object or any known distances. Any way out?



Adrian Rosebrock

[January 7, 2017 at 9:38 am](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415334) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415334>)

You would need to compute the intrinsic properties of the camera first. I would suggest [starting here](https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib) (https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib).



Tanya

[January 13, 2017 at 12:37 am](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415705) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415705>)

X

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**Adrian Rosebrock**

January 13, 2017 at 8:32 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415715>)

It really depends on the quality of the images themselves. How high is the resolution of your image capture?

**Tanya**

January 15, 2017 at 7:36 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415855>)

around 640×480 pixels/each image
for area of 1 x 2 cm

**Adrian Rosebrock**

January 16, 2017 at 8:09 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415872>)

Hmm, that's a pretty small resolution for that accurate of results. The first step would be to calibrate your camera and account for barrel distortion. If your images are really noisy and you can't *accurately* segment the object from every image, then you're in for some real trouble. But if you can get a nice segmentation I would give it a try and see what results you come up with. It's best to experiment with projects like these and note what does and *does not work*.



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**Rahmat Hardian Putra**

January 15, 2017 at 7:15 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415812>)

Hi Adrian.. your article is a really great tutorial 😊

btw i'm working on a project that measure distance of a fire, but fire tend to change it shape, whether it smaller or bigger, so the marker also get bigger or smaller, therefore I can't define the width and height of the marker.

the question is, can I modify your algorithm so that I can measure distance with my condition ?
or do you have another method that suitable to measure distance of a fire ?

Thanks in advance

Regards

Rahmat Hardian

**Adrian Rosebrock**

January 15, 2017 at 12:01 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-415826>)

It sounds like you might need a more advanced calibration technique. I personally haven't done/read any research related to fire direction techniques with computer vision, but I would suggest reading up on intrinsic camera properties for calibration.



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I used my iPhone to capture the example photos. The photos were moved to my laptop. And then I processed the photos using my laptop. The actual method used to capture the photos doesn't matter as long as (1) its consistent and (2) you are calibrating your camera.

**Musa**

April 17, 2017 at 3:44 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-423044>)

Hi Adrian,

I'm trying to copy this method for a USB camera and have used your previous posts to modify it to work with a camera using a while loop. The problem I'm having is the max function in find_marker is constantly coming out as None hence resulting in the distance_to_camera function throwing an error. Do you have any idea why this could be?

**Horus**

May 19, 2017 at 5:18 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-425542>)

Hi,

I have an CT 2D image with two projection. in the image there are spherical objects, free or occluded. How can I get the depth of those spheres and their centre. An idea or any help

X

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inches:

24.0

201.873157429

17.7140389174

what is error?



youssef

June 13, 2017 at 4:21 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-427220>)

Hey adrian, this website is the bestest reference for beginners, but may i ask if for example the camera is not looking straight to the object the distance in pixels would change so it wouldn't work right ?

if my logic was correct how to overcome this ?

thank you



Adrian Rosebrock

June 13, 2017 at 10:54 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-427243>)

If there is variation of viewpoint then you would definitely want to calibrate your camera by computing the intrinsic properties of the camera. This will give you more reliable results.



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**Adrian Rosebrock**

June 16, 2017 at 11:17 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-427456>)

Hi Randy — double check your image paths to `cv2.imread`. It looks like your image path was invalid, causing `cv2.imread` to return `None`. The `cv2.imread` function does not throw an error when an invalid image path is supplied.

**Sid**

June 29, 2017 at 2:51 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-428453>)

Hi Adrian,

Amazing tutorial to get me started with the marker detection. It was really easy to understand with all the explanation that you've given! Cheers to that 😊

Lets say I wish to detect an object which is totally black with a size of (2 in x 2 in). How would I be able to do that with your code?

Thanks

**Adrian Rosebrock**

June 30, 2017 at 8:13 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-428453>)



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Hey Aman,

In order to calculate you used $L = W \cdot F/P$

L = length of the object from cam

W =Width of object

F =Focal length

P = Pixel width of the object

But in the code for the pixel width you supplied the value `marker[1][0]`.

my question:

1) What is the meaning of `marker[1][0]`?

2) Also, shouldn't you just convert the value of knownwidth into pixel and hardwire into the code? Instead of `marker[1][0]`

Thanks !

P.S. I am applying your code(modifying it a bit) for faces. I am also very new to programming so sorry if my questions are too silly.



Jackson Curry

[June 27, 2019 at 6:11 pm \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-523381\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-523381)

marker here returns the parameters of `minAreaRect` which are these 3 parameters: (`center (x,y)`, (`width, height`), angle of rotation). Note that the first and second parameter here actually have 2 parameters within them (`x,y`) or (`width,height`). Thus why he is doing `marker[1]` to access the second parameter and then the first parameter which corresponds to



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August 14, 2017 at 1:22 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-432332>)

Yes, absolutely. As long as either the width or height is known you can use the same algorithm.



Shehroz

August 22, 2017 at 8:03 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-432957>)

Hi Adrian

Can i use Kinect sensor as my camera?if so,do i have to change something?



Adrian Rosebrock

August 22, 2017 at 10:42 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-432975>)

It's been a long time since I've used the Kinect camera, but I would likely recommend something like [PyKinect](https://github.com/Microsoft/PTVS/wiki/PyKinect) (<https://github.com/Microsoft/PTVS/wiki/PyKinect>).

X

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Please tell me your recommendations and experiences. That's my masterthesis and I have not enough time.

Thanks



Adrian Rosebrock

August 31, 2017 at 8:38 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-433751>)

If you need to measure the size of a person you don't actually need any machine learning outside any you might want to apply to detect a person in a photo/video stream. Simply compute the intrinsic/extrinsic parameters of the camera and calibrate.

Computing weight is much more challenging. If you're using a 2D camera I doubt you'll be able to obtain a reliable weight measurement. Perhaps machine learning could be used here with enough training data but I would be very skeptical.



Rahul Tripathy (<https://github.com/tripsBro>)

September 1, 2017 at 11:50 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-433846>)

Hi Adrian,

I definitely liked the approach but I do have a few questions. It would be great if you answered

...

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**Adrian Rosebrock**

September 1, 2017 at 11:58 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-433847>)

This is a basic form of distance measuring. For varying viewpoints and more advanced distance measuring you would *definitely* want to calibrate your camera by computing the intrinsic/extrinsic parameters. If you have multiple cameras or a stereo camera you can compute the depth map.

**Ram**

September 13, 2017 at 3:20 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-434800>)

I'm getting this error on run of this program:

```
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)  
ValueError: too many values to unpack
```

plzz solve my doubt

**Adrian Rosebrock**

September 13, 2017 at 3:21 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-434801>)



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**Adrian Rosebrock**September 28, 2017 at 8:57 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-435909>)

Please see this post (<https://www.pyimagesearch.com/2016/04/04/measuring-distance-between-objects-in-an-image-with-opencv/>).

**Carlos (<http://Www.gmail.com>)**October 3, 2017 at 9:50 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-436351>)

Hey Adrian, I have learned a lot with your tutorials, thanks you! I

I am currently working on a very challenging project where I need to determine the X and Y coordinates of an object in relation to the room it is in. I know the real height of the object and how the camera perceives it's height in pixels, my difficult is how I come up with the X and Y coordinates? The linear diantace from the camera to the object is possible to be calculated by using the triangle.

Best

Carlos



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[October 19, 2017 at 1:05 pm \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438031\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438031)

Hello, where can I find theory about the perceive focal length. I've looked into the triangle similarity and coundn't find a relation between them



Manh Nguyen

[October 24, 2017 at 5:13 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438486\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438486)

Hi Adian, This post is very interesting, Everyweek I have to read your website for studying computer vision. I have a question. I mesure two time. the first time, Distance and width = const so I calculated focal length F. the second time, I measure distance by ultrasonic sensor and F =focal length in first time and I measure width. If I do this, the result is correct? Pls help me. Wish you have a nice day, thank you!



Adrian Rosebrock

[October 24, 2017 at 7:09 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438496\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-438496)

Hi Manh — I haven't used ultrasonic sensors for distance measurement so I would do a bit more research into this.



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**Mary**

November 6, 2017 at 4:49 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-439780>)

Thank you. Can I make it work with a video instead of images? where I need to calculate the distance between the camera and a person face?

**Adrian Rosebrock**

November 6, 2017 at 10:26 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-439795>)

Yes, I would suggest take a look at [this blog post](#)

(<https://www.pyimagesearch.com/2016/01/04/unifying-picamera-and-cv2-videocapture-into-a-single-class-with-opencv/>) on accessing video streams as well as my book, [Practical Python and OpenCV](#) (<https://www.pyimagesearch.com/practical-python-opencv/>).

**Amanda Joy Panell**

November 13, 2017 at 7:21 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-440519>)

Do you think this technique could be tweaked to find the distance of something REALLY far away? (3-5 miles) accurately?



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November 15, 2017 at 12:54 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-440621>)

Traceback (most recent call last):

...
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
ValueError: too many values to unpack

Hi Adrian, I have face a problem since i just try to run the program why will come out those error? can tell me why ? thank you.



Adrian Rosebrock

November 15, 2017 at 12:54 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-440677>)

Please take a look at the comments as this question has already been addressed. In particular, I address this question in my replies to “Minjae”, “Chandrama”, and others. The quick and dirty solution is:

```
(_, cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST,  
cv2.CHAIN_APPROX_SIMPLE)
```

Since you are using OpenCV 3.



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**TrAyZeN**

November 21, 2017 at 12:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-441258>)

Hello, in what unit the focal length is express ?

**Adrian Rosebrock**

November 21, 2017 at 1:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-441260>)

In this tutorial we use “inches” as our unit of measurement. However, you can convert the code to use another unit.

**Srinivasan**

November 24, 2017 at 4:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-441509>)

Hey Adrain,

This code is good for distance calibration. I have small that when it's fixed frame of paper its calculated easily. When calculating distance of moving object how to calibrate the distance, where you don't know the exact size of the object(Both physical size and pixel size of the

X

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**Adrian Rosebrock**

November 27, 2017 at 12:57 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-441773>)

Hi Joseph — I would suggest referring to [this blog post](#) (<https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/>) on measuring the size of objects in an image.

**Kevin Roy**

November 30, 2017 at 9:34 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-442037>)

Hi Adrian,

I've recently started openCV and have been following your tutorials. So far, its been the best series of tutorials I've ever found, online and otherwise. Currently, I am working on a little side-project which requires me to crop a square part of an image. The part needed to be cropped is random so I cannot directly mention the X, Y coordinates in the code. Therefore I tried to use the find_marker function in this post to find the square and then crop it. But as soon as I run the program, I get the following error:

```
(cnts, _) = cv2.findContours(edged.copy(), cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)  
ValueError: too many values to unpack
```

Can you please help me to sort it all out?



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Hi Adrian,

I am a MSc student at National Technical University of Athens, and my master thesis is Real Time Position Tracking of an underwater robotic fish inside a tank full of water. I use your color tracking algorithm, to extract (x,y) position of the fish. The robotic fish is moving in a plane xy that is perpendicular to my camera. At this moment the distance is at 135 cm from the camera. I want to add to my code, a block of code that calculates the distance of the moving plane from the camera, to update the distance in case of moving fish deeper in the water.

I want to combine your color tracking algorithm with that distance find algorithm, real time.

I have three questions:

1. According to your code (distance from camera), the focal length is at mm units? Your focal length result is 543.45. My focal length result is in range of 200 – 800 testing a variety of cameras available. If focal length units are in mm, is there any logical explanation of too much high values? Because from what I know, focal length must be small (3 – 10 mm). I use simple webcameras.

2. The distance you calculate is the distance from camera to the perpendicular plane or the distance from camera to the object, where the object has coordinates (x,y), not to the center of the screen?

3. This algorith you are using, is calculated on the air. My robotic fish is inside the water. Will the result changes if the color tracking is happening inside the water? Because due to refractive effects I think I will face a big problem.



Benni

December 6, 2017 at 10:30 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-442534>)

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Saurabh Thawali

December 24, 2017 at 4:13 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-444416>)

That's awesome and exactly i was looking for to implement in my personal project 😊

Lucky to find such a detail resource, Appreciate your great work and advice/comments Adrian Rosebrock.... You rock \m/ \m/

Now i am implementing this using laptop webcam the way you guided in your another post here <https://www.pyimagesearch.com/2015/05/25/basic-motion-detection-and-tracking-with-python-and-opencv/> (<https://www.pyimagesearch.com/2015/05/25/basic-motion-detection-and-tracking-with-python-and-opencv/>)

but i am not sure how your Room Status (occupied/unoccupied) is changing based on calculations....may be i need to work on it more.

Thanks once againMuch appreciated !!



Adrian Rosebrock

December 26, 2017 at 4:15 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-444712>)

Thanks Saurabh 😊 I'm glad you found the post useful! The room status is changed based on background subtraction. For a more advanced background subtraction algorithm, [take a look at this blog post](https://www.pyimagesearch.com/2015/06/01/home-surveillance-and-motion-detection-with-the-raspberry-pi-python-and-opencv/) (<https://www.pyimagesearch.com/2015/06/01/home-surveillance-and-motion-detection-with-the-raspberry-pi-python-and-opencv/>).



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**Adrian Rosebrock**

December 31, 2017 at 9:49 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445254>)

The `cv2.minAreaRect` function returns a bounding box that can be rotated, hence the term the minimum area rectangle that the region will fit into. The `cv2.boundingRect` function will return a non-rotated bounding box.

**Nachiket**

January 2, 2018 at 2:38 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445373>)

Ok Got it. Here in this example, we can use either of them, right? Can you tell me a particular example where we 'should' use minArea function and an example where boundingRect should be used?

Thank you

**Adrian Rosebrock**

January 3, 2018 at 1:04 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445526>)

As an example, you should use the `minAreaRect` when you need a rotated bounding box and then later need to apply a perspective transform, such as in the [document scanner post \(<https://www.pyimagesearch.com/2014/09/01/build-kick-ass-mobile-document-scanner-just-5-minutes/>\)](https://www.pyimagesearch.com/2014/09/01/build-kick-ass-mobile-document-scanner-just-5-minutes/). If you used `boundingRect` the four points of the rectangle would ~~not match the vertices of the document we are "cropping"~~.



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**Adrian Rosebrock**

January 5, 2018 at 1:23 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445716>)

It sounds like either the reference object or the object you want to compute the distance to was not detected. Check the contours list and ensure they were detected.

**Karan**

January 8, 2018 at 2:28 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445935>)

Good evening sir, I want to know how can I detect the height at which object is placed from the ground when we are using a webcam as a feed...
thanks sir in advance..
please do reply

**Adrian Rosebrock**

January 8, 2018 at 2:30 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-445936>)

Hey Karan — take a look at [this blog post](#) (<https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/>) where I discuss how to measure the size of objects in images. I hope that helps!



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much much appreciated and will be a great support to complete my project. again thank you very much for the tutorials.

**Adrian Rosebrock**

January 16, 2018 at 12:45 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-446620>)

Congrats on working on your final year project, that's great! It's hard to give generic tips so could you please elaborate on what specific issues/errors you are encountering when trying to combine the code from the two posts?

**SNR**

January 18, 2018 at 10:05 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-446850>)

Thank you very much for replying, I tried to add the 'finding distance' code to the 'ball tracking' code. I'm having trouble finding the exact position where the 'finding distance' code should start in the original 'ball tracking' code.

Also I should not be using the 'find marker' statement at the beginning right? Since I'm already tracking the ball and contouring it in the 'ball tracking' code.

And I changed the term 'image' to camera, giving the camera = cv2.VideoCapture(0) command.

I also removed the IMAGE_PATHS = ["images/2ft.png", "images/3ft.png", "images/4ft.png"]



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I would start by ensuring you have performed the calibration and computed the triangle similarity. If I understand your project correctly, there isn't a point in trying to track an object if you haven't computed the distance, correct? Thus, you need to calibrate first.

Once you have your focal measure you can move on to the actual tracking. Here you'll be looping over frames from your video stream and looking for your object. If you're using the ball tracking code, here you will be performing color thresholding. Once you find the ball in the mask you can pass this area into the `distance_to_camera` function which will give you your distance.

It can be tricky putting together code from multiple posts, especially if you're new to image processing and computer vision, but it is doable. I would recommend that you work through [Practical Python and OpenCV](https://www.pyimagesearch.com/practical-python-opencv/) (<https://www.pyimagesearch.com/practical-python-opencv/>). I designed this book to help beginners with zero experience in computer vision/image processing get up to speed quickly. It's a quick read and if you pick up a copy, you'll be done by the end of the weekend and be better prepared to tackle your ball tracking + distance measurement project.

I hope that helps!



SNR

[January 31, 2018 at 10:38 pm](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-448454) (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-448454>)

thank you very much for all the tips. i have calibrated and found the focal length and also the color threshold. i don't understand the part where you tell to, "pass this area into the

X

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**mithilesh**

February 23, 2018 at 4:30 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451065>)

hi adrian you did an awesome job there...i have a question regarding finding the depth of an object in an single shot of camera..is this possible?

**Adrian Rosebrock**

February 26, 2018 at 2:10 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451400>)

This method will give you the distance to the object. Are you referring to computing a depth map for the entire image?

**mithilesh**

February 27, 2018 at 12:16 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451465>)

yes

**Adrian Rosebrock**

February 27, 2018 at 11:29 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451508>)

Computing the depth map is best done using a stereo/depth camera. Are you trying to

X

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pi camera for distance tracking...

Thanks,

Amir



Adrian Rosebrock

February 26, 2018 at 2:05 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451394>)

Hey Amir — **this tutorial (<https://www.pyimagesearch.com/2015/09/14/ball-tracking-with-opencv/>)** demonstrates how to detect and track an object based on color. You can combine the code for both of these tutorials.



ami

February 27, 2018 at 10:29 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451494>)

Hey adrian, really appreciate your response.

I couldn't delete/modify my original reply apologies. When merging this code for detecting colour in a stream, i'm not sure if you still use your images for calibration and calculating focal length because I am thinking that you have to somehow leverage the colour (in my case its blue) to be used as a reference point to measure from..? Spent a few days on this now and I'm struggling on trying to figure out how to combine the two functions so that the distance to the blue colour from the picamera can be measured in live stream..

X

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2. The initial distance to the object (again, in measurable units)

Once you perform the initial calibration you no longer need the reference object.

Try to nail down the code used to compute the focal length *before* you try incorporating the actual tracking of the object and measuring the distance.

It can be a tedious process, but this is how we learn. Keep it up, you're doing great 😊



Tsaqif Alfatan Nugraha (<http://bukajendeladuniamu.wordpress.com>)

February 25, 2018 at 10:59 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451304>)

Hi adrian, This post is awesome !

I would like to ask you two questions:

First, is the focal length will different if the object we measure different too ? For example, first i used paper and get the focal length . Then, i want to measure distance from a car to camera. Can, i use the first focal length when to measure distance a car to camera.

Second, how we can measure the object that is not parallel to camera ? For example, i want to measure parallel distance between camera and traffic light. The traffic light located above the camera. Is this way can be implement on this measurement ?



Adrian Rosebrock



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March 4, 2018 at 10:43 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-451976>)

Sir, your work is awesome and very helpful. But i have 2 questions

1) sir, how did you know the image is only 270 pixels wide because if i take image with my android camera i am getting 3024 pixels width

2)and later you mentioned that by moving some distance back you get 180 pixels width of the object through image processing.how did u get that

sir, i am doing my final year project on this topic only.could you please help me out??

Thank you in advance



Adrian Rosebrock

March 7, 2018 at 9:35 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-452283>)

I did not know the sizes n pixels. I knew (1) the distance from the camera to the object and (2) the width of the object. Once I detected the object in the image I could determine any pixel dimensions.



ADAM

March 10, 2018 at 4:55 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-452283>)



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**SKR**

March 29, 2018 at 3:12 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-454571>)

As usual AR rocks with his technical yet easy to follow articles!

I would request to have some 1) suggestions, 2) pointers, and 3) insights regarding a problem I am working on since past a few days. Instead of having one image, how would you compute depth (Z-coordinate), if you have two images? Let us say for example, you have two time-aligned videos, first showing the front view and the second showing the left-side view. We can extract RGB frames from both videos so we have two images now. Without having any knowledge of camera intrinsic or width of object or focal length how you can compute the depth and thereby the real X,Y,Z coordinates using these two images? Please suggest all methods/techniques or provide pointers to resources, perhaps your own article on this problem, and if possible give some insights. The video contains a person sitting and changing his gaze so the problem relates to estimation of gaze.

Lastly, by any logic or technique, is it possible to measure depth from single video, if we have multiple frames extracted at different times without camera or object moving?

**Adrian Rosebrock**

March 30, 2018 at 6:52 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-454637>)

This method is a very simplistic form of camera calibration. If you want to be working with depth you should compute the extrinsic/intrinsic parameters of the camera and perform a full-blown calibration. I wouldn't suggest any approximations (they won't work). I haven't worked with depth from a single video/camera so I'm not sure about the answer to that. [This video](#)



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giving a side pose. I can extract multiple frames from each videos and can start working.

Source Wiki: It is possible to perform rectification without having the camera parameters. All that is required is a set of seven or more image to image correspondences to compute the fundamental matrices and epipoles. Ref: Richard Hartley and Andrew Zisserman (2003). Multiple view geometry in computer vision. Cambridge university press.

So if we can perform rectification using more than seven extracted frames, is it possible to arrive at depth somehow? Thanks so much for your pointers and insights.



Adrian Rosebrock

April 4, 2018 at 12:40 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-455107>)

I believe the [OpenCV docs \(\[https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib\]\(https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib\)\)](https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_calib3d/py_table_of_contents_calib3d/py_table_of_contents_calib3d.html#py-table-of-content-calib) have something similar to what you are referring to. I would suggest starting there. You need seven images (typically the “chessboard”) and keypoint correspondences to compute the fundamental matrix. The OpenCV docs cover this.



SKR

May 1, 2018 at 11:39 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-459578>)

Hey Adrian, just a quick question, do you have any idea about what a volume blending

X

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**lulu**

March 31, 2018 at 2:33 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-454732>)

hi Adrian, i want to used your distance formula in my thesis. could you give me reference where you get that formula so i can put it on my thesis ?

thank you

**Adrian Rosebrock**

April 4, 2018 at 12:45 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-455113>)

Triangle similarity is a basic Geometry topic. Most Geometry textbooks will cover it. If you want to include a reference to this PyImageSearch blog post, please feel free to do so, but I don't think there is a "singular source/reference" for using triangle similarity.

**ayesha sh**

April 15, 2018 at 6:30 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-456796>)



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[post \(https://www.pyimagesearch.com/2016/01/04/unifying-picamera-and-cv2-videocapture-into-a-single-class-with-opencv/\)](https://www.pyimagesearch.com/2016/01/04/unifying-picamera-and-cv2-videocapture-into-a-single-class-with-opencv/) and then merging the code together.

**AliK**

[April 18, 2018 at 6:37 pm \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-457409\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-457409)

Hi Adrian..thanks for your as-always great tutorial...I have one question: imagine after edge detection (figure 1) you needed to choose the contour of your measuring tape (instead of the piece of paper).. do you have any idea how that can be done? (consider the image is busy so it cannot be defined simply as the contour on far right or far left hand side of the image)..for example, is there a way to use two parallel lines (which is the property of measuring tape) to detect its contour in a busy image? Thanks for any suggestions you might have!

**Adrian Rosebrock**

[April 20, 2018 at 10:10 am \(https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-457641\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-457641)

Yes, you can do this. Take a look at the “cv2.HoughLines” function in OpenCV (I do not have any tutorials on this method, unfortunately).

**AliK**

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Which function/line return it's value in above code?

**Adrian Rosebrock**

May 17, 2018 at 7:04 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-462251>)

The “find_marker” function is responsible for finding the marker (in this case, the piece of paper) in the image. The “cv2.minAreaRect” returns the (rotated) bounding box.

**dheeraj**

June 26, 2018 at 12:07 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-469257>)

which camera would be preffered for this project?

**Adrian Rosebrock**

June 28, 2018 at 8:16 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-469396>)

I used my iPhone to gather the example images. If you would like a USB camera I really like the [Logitech C920](#) (<https://amzn.to/2IzpDSK>).



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I'm not sure I understand your question properly but the "cv2.imshow" function is used to display an image to your screen. I'm not sure what else you may be looking for.

**ahsan**

July 8, 2018 at 7:31 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-470333>)

hello sir,
can you help me,? please

whether the code that displays the pixel value is "marker[1][0]".?
but why the program I created pixel value there is its comma, not an integer

thanks

**Tux**

July 10, 2018 at 5:42 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-470547>)

Hi Adrian and thank you for all your brilliant work.

Can you explain why you work on 800x600 images instead of the originals please ?

X

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**Jamie McMahon**

July 21, 2018 at 4:42 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-471661>)

Hi Adrain, like a lot of people that follow you im a bit of a beginner and having a really stupid error but cant seem to find the solution for it. When I compile the code here I get the following error message:

“Traceback (most recent call last):

```
File ‘distance_to_camera.py’, line 37, in
image = cv2.imread(IMAGE_PATHS[0])
NameError: name ‘IMAGE_PATHS’ is not defined”
```

Any suggestions on how to fix it?

**Adrian Rosebrock**

July 25, 2018 at 8:49 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-472010>)

Hey Jamie! Thank you for catching this error. I had recently updated the blog post to work with both OpenCV 2.4 and OpenCV 3 (and future versions) but had refactored part of the code. If you take a look at the updated blog post, in particular Line 37, you’ll see it now reads:

```
image = cv2.imread("images/2ft.png")
```



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**a010291**

October 3, 2018 at 8:17 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-480618>)

Hi Adrian,

Useful tutorial. I know this question has been raised already but still unable to get proper answers.

Is it possible to determine the distance of a person(face) from the camera? If possible can you kindly tell me how to proceed. I am almost stuck with this issue for weeks.

**Adrian Rosebrock**

October 8, 2018 at 10:23 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-481211>)

You can swap in [a face detector \(<https://www.pyimagesearch.com/2018/02/26/face-detection-with-opencv-and-deep-learning/>\)](https://www.pyimagesearch.com/2018/02/26/face-detection-with-opencv-and-deep-learning/) instead of the rectangle detector that we used here. From there the rest of the code is the same but keep in mind you may still want to use the piece of paper to calibrate the system first as face/head sizes will vary depending on the person.



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plot a map of the room.

If not, do you have any suggestions on how to do this type of thing?

Thanks!



Adrian Rosebrock

October 12, 2018 at 9:27 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-482200>)

It's absolutely possible but I would instead suggest researching Simultaneous Localization and Mapping (SLAM) algorithms — they can be used to map areas.



Shrijan00

October 18, 2018 at 4:50 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-483141>)

Hey Adrian

I'm still confused why u choose marker[1][0] only?



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question is: from different angle views, the object in the image has different dimensions. How can I get the distance in these (most frequent) cases?

Thank you very much!



Adrian Rosebrock

October 22, 2018 at 8:13 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-483564>)

In that case you may want to see if it's possible to compute the intrinsic/extrinsic parameters of the camera — it will give you a much more accurate calibration of your camera and be better for different viewing angles.



Gianluca

October 22, 2018 at 9:25 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-483567>)

Hi Adrian,

I will calibrate the camera in the next days, but how can the calibration result parameters be useful for getting a better estimate from different viewing angles?

Thank you



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I hope for your response and thanks also for the projects you shared to us....

**Dhiren Motwani**

October 29, 2018 at 10:36 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-484404>)

Thank you for such a great tutorial! I am working on a pothole detection project and I will be trying to use this in my project. Can the given code be updated to find the distance from a camera to the center pixel of the image? (i am new to opencv)

**Sanjay**

January 3, 2019 at 6:17 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-494609>)

Hello Sir,

What if I do not know the initial distance of the object from camera? In this case how can I find the distance of the object from my camera at any point of the time? I need it to make my robot to follow the moving object (for example rolling ball on the surface) continuously.

Thank you



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how can we define Perceived focal length F ?

**Adrian Rosebrock**

January 22, 2019 at 9:27 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-497433>)

The code automatically defines the perceived focal length once the reference object is detected.

**Ben**

January 29, 2019 at 5:00 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-498432>)

Hi Adrian,

Can cv2.selectROI be used to measure the apparent width in pixels of the ROI?

It outputs 4 values but I am not sure what they are... x,y, height, width??

**Adrian Rosebrock**

February 1, 2019 at 7:22 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-498956>)

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**Adrian Rosebrock**

February 14, 2019 at 1:24 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-501329>)

Are you referring to the initial calibration of the camera?

**sonay**

February 20, 2019 at 4:45 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-502584>)

Hello Adrian,

I follow you for a long time, it is a great tutorial as always. I am trying to implement this on my rpi model B, but I am getting an error on line 5. can you please help?

**Adrian Rosebrock**

February 22, 2019 at 6:43 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-502836>)

What specifically is the error? Without knowing the error I cannot provide any suggestions.



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I would suggest starting with my [YOLO object detection post](#).

(<https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/>) That tutorial will teach you how to use YOLO with OpenCV. From there you can replace the contour-based object detector with the YOLO object detector.



Kunal Choudhary

February 22, 2019 at 8:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-502846>)

Is it possible to use this algorithm to estimate the distance of multiple objects from moving camera in real time?



Adrian Rosebrock

February 22, 2019 at 9:04 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-502854>)

Yes, but you will need to modify the code to detect each of the individual objects.



KUMARESH A

February 26, 2019 at 1:35 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-503463>)



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Refer to [this tutorial. \(<https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/>\)](https://www.pyimagesearch.com/2016/03/28/measuring-size-of-objects-in-an-image-with-opencv/)



vikram kumar

[February 28, 2019 at 12:04 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-503911>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-503911)

hello sir, how can i measure the distance between the objects in real time using the windows 10



Benjamin Brown

[March 5, 2019 at 9:58 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505022>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505022)

Would this still work if the camera was looking at the paper from an angle?



Adrian Rosebrock

[March 5, 2019 at 10:02 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505024>\)](https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505024)

No, it wouldn't work as well if the camera was angled. In that case take a look at a proper camera calibration using intrinsic/extrinsic parameters. I might be covering that in a future



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**Adrian Rosebrock**

March 8, 2019 at 5:33 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-505574>)

I would place, at a bare minimum, of four different markers in your backyard. Compute the distance between each one of the markers. For any photo being taken you should be able to detect at least one of the markers. Based on that, you can compute the relative distance to all other makers and determine your location.

**Zeeshan Ahmed**

March 12, 2019 at 6:44 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-506281>)

Hi! can you tell me how can i calculate distance to any object in formula { focal length = (pixel*distance) / width} from the moving camera traveling from Point A to Point B at n speed?

**Shipra**

April 2, 2019 at 7:02 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-510770>)

Hi Adrian

X

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**ishani**

April 15, 2019 at 2:14 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-512885>)

Hi Adrian, Thank you very much for your clear explanations. Do you also have a tutorial on stereo vision?

Thank you !

**Adrian Rosebrock**

April 18, 2019 at 7:18 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-513461>)

Sorry, I do not have any tutorials on stereo vision.

**Ali Mehmood**

April 18, 2019 at 2:52 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-513376>)

Hello Adrian, I have a problem.

I have an image, and I want to find distance between camera and a particular object in that image. There may be some other objects too in that image but I have used ML algorithm to find that particular object and get a bounding box on it. I have following data:

Roughly fitted bounding box around the object in the image.

I know actual dimensions of that object in real world

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Hi, I like to track a target from the webcam by developing in javascript with opencv.js can you guide me?

**Adrian Rosebrock**

May 30, 2019 at 9:00 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-519900>)

Sorry, I don't have any experience with OpenCV.js.

**Rizqi Gunawan**

June 30, 2019 at 4:39 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-523711>)

I am working on navigation system for multirotor that will fly below 10 meters, there will be a landing pad with red color 3mx3m then i need to move the drone exactly 15m away from that location. can i used this method to measure the altitude ?

**Adrian Rosebrock**

July 4, 2019 at 10:40 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-524394>)

You should use a more accurate camera calibration by computing the intrinsic/extrinsic



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**Rajii**

July 22, 2019 at 4:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-526718>)

Thanks adrian.

I have utilized the content.

now i can measure object – camera 90 degree incident distance .

is there any method to calculate object – camera non 90 degree incidents.

regards

**suriyaa (<http://pyimagesearch.com>)**

July 29, 2019 at 8:33 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-528164>)

hi sir,

iam from big fan of your blog which is very use usefull in my projects

can you able to post the blog of detecting distance from camera to object in real live stream

**Brhayan Liberato Tafur**

July 31, 2019 at 12:24 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-528164>)



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I'll try to cover intrinsic/extrinsic camera calibration in a separate tutorial.

**Sajjad Zaidi**

September 15, 2019 at 5:20 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-551498>)

Hello Sir,

Is it necessary to resize images to a lower resolution e.g. 600 x 800 in the resources provided.
Is there any other work around?

**hasan**

October 7, 2019 at 11:47 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-560264>)

hi Adrian,

i wanna estimate to object distance from source in live video for guidance & navigation it,
but your method is based on known width 😞

what can i do to solve this problem?

thank,



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**Ardhika Nofardiansa**

December 1, 2019 at 12:31 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-587460>)

can i use this code for real time video?

**Kartik Malhotra**

December 30, 2019 at 12:58 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-620399>)

Amazing post as always Can you please share me your knowledge on how to calculate 3d object distance like what tesla do finding depth of field using 2 camera.

**David B**

January 11, 2020 at 4:24 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-643094>)

Hi Adrian,



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**Josef**

February 28, 2020 at 10:50 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-759576>)

Hey Adrian! Thanks alot for the post it was really helpful!
but can i apply this to live stream from webcam? and if so can you tell me how?
Thanks again!

**Adrian Rosebrock**

March 4, 2020 at 1:40 pm (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-765481>)

You should start by **learning how to access your webcam.**
(<https://www.pyimagesearch.com/2016/01/04/unifying-picamera-and-cv2-videocapture-into-a-single-class-with-opencv/>) From there you can start integrating the code into a video stream.

**Frank**

March 3, 2020 at 4:51 am (<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-765335>)

Dear Adrian

I want to thank you for your excellent blog on opencv. The tutorials are the best you can get!



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says:

[April 20, 2015 at 11:56 am \(<https://www.pyimagesearch.com/2015/01/19/find-distance-camera-objectmarker-using-python-opencv/#comment-306906>\)](#)

[...] And we even leveraged the power of contours to find the distance from a camera to object or marker. [...]

Before you leave a comment...

Hey, Adrian here, author of the PyImageSearch blog. I'd love to hear from you; however, I have made the decision to no longer offer free 1:1 help over blog post comments. I simply do not have the time to moderate and respond to them all.

To that end, myself and my team are doubling down our efforts on supporting our paying customers, writing new books and courses, and authoring high quality Computer Vision, Deep Learning, and OpenCV content for you to learn from.

I'd be happy to help you with your question or project, but [I have to politely ask you](#)

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